GridWorks RD&D Planning Workshop

“Perspective on Cost and Performance of Existing Products”

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Perspective on Costs and Performance of Existing Products

- Today's Transmission System Requires More Capacity and Flexibility
- Right-of-Way is Difficult to Obtain
- Transmission Investment Incentives are Minimal
- Optimum is to Cost Effectively Modify Existing Infrastructure
- Most Transmission in U.S. is Overhead
- Transmission Limits: Voltage, Stability, Thermal
- Focus on Thermal Limitations - Sag

Business Drivers For Overhead Transmission

- Safety
- Reliability
- Longevity
- Cost

Existing Overhead TransmissionProducts

(Based on Data Available to the Author)

- Products:
  - ACSR (not Trapwire)
  - ACSS
  - Alumina Composite Core
  - Polymer Carbon Fiber Composite Core
- Criteria:
  - Rated Ampacity
  - Max Operating Temp.
  - Sag
  - Al Conductivity
  - Tensioning
  - Long Term Creep
  - Cost (Est.)

Aluminum Conductor Steel Reinforced (ACSR)

"The Most Common Conductor"

• Criteria:	• Data:
• Rated Ampacity	• 905 Amps [1x ACSR]
• Max Operating Temp.	• 75 Degrees C
• Sag	• 0.125 ft/^{o}C
• Al Conductivity	• 61.2% IACS
• Tensioning	• Same as ACSR
• Long Term Creep	• Stable, Predictable
• Cost (Est.)	• 1xACSR

Aluminum Conductor Steel Supported (ACSS)

- Criteria:
  - Rated Ampacity
  - Max Operating Temp.
  - Sag
  - Al Conductivity
  - Tensioning
  - Long Term Creep
  - Cost (Est.)
- Data:
  - 1827 Amps [2x ACSR]
  - 250 Degrees C
  - 0.125 ft/^{o}C
  - 63% IACS
  - Same as ACSR (or Less)
  - Stable, Predictable
  - Approx. 1.2xACSR

Aluminum Conductor Alumina Composite Core

- Criteria:
- Rated Ampacity
- Max Operating Temp.
- Sag
- Al Conductivity
- Tensioning
- Long Term Creep

- Data:
- 1997 Amps [2.2x ACSR]
- 240 Degrees C
- 0.04 ft/^{o}C
- 60% IACS
- Same as ACSR
- Stable, Predictable

Polymer Carbon Fiber Composite Core

• Criteria:	• Data:
• Rated Ampacity	• 1903 Amps [2.1x ACSR]
• Max Operating Temp.	• 200 Degrees C
• Sag	• < 0.04 ft/^{o}C (Est.)
• Al Conductivity	• 63% IACS
• Tensioning	• Same as ACSR
• Long Term Creep	• Unknown, (Unpredictable)
• Cost (Est.)	• Approx. 5xACSR

Conclusion

- Increase Capacity of Current Infrastructure
- Research Cost-Effective, High Temperature, Low Sag Overhead Conductors